

Course ID: ECE 440 Introduction to Computer Networks-Spring

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Homework #2

1. Problem P4, Chapter 2 (40%)

Consider the following string of ASCII characters that were captured by Wireshark when the browser send an HTTP GET message. Answer the following questions, indicating where in the HTTP GET message below you find the answer.

```
GET /cs453/index.html HTTP/1.1<cr><lf> Host: gaia.cs.umass.edu<cr> User-Agent: Mozilla/5.0  
(Windows;U; Windows NT 5.1; en-US; rv:1.7.2) Gecko/20040804 Netscape/7.2 (ax) <cr><lf> Accept:  
ext/xml, application/xml, application/xhtml+xml, text/html;q=0.9, text/plain; q=0.8, image/png, */*;  
q=0.5<cr><lf> Accept-Language: en-us, en;q=0.5<cr><lf> Accept-Encoding: zip, deflate<cr><lf>  
Accept-Charset: ISO-8859-1, utf-8; q=0.7, *; q=0.7<cr><lf>Keep-Alive: 300 Connection:keep-alive
```

(a) What is the URL of the document requested by the browser?

/cs453/index.html

(b) What version of HTTP is the browser running?

HTTP/1.1

(c) Does the browser request a non-persistent or a persistent connection?

persistent

(d) What is the IP address of the host on which the browser is running?

IP cannot be determined from the GET request

(e) What type of browser initiates this message? Why is the browser type needed in an HTTP request message?

Mozilla/5.0 The type of browser determines the type of content to send (i.e. command line vs. mobile vs. desktop).

2. Problem P5, Chapter 2 (30%)

The text below shows the reply sent from the server in response to the HTTP GET message in the question above. Answer the following questions, indicating where in the message below you find the answer.

```
HTTP/1.1 200 OK<cr><lf>Date: Tue, 07 Mar 2008 12:39:45GMT <cr><lf>Server: Apache/2.0.52  
(Fedora) <cr><lf>Last-Modified: Sat, 10 Dec 2005 18:27:46 GMT <cr><lf>Etag: "526c3-f22-a88a4c80"  
Accept-Ranges: bytes<cr><lf>Content-Length: 3874 <cr><lf> Keep-Alive: timeout=max=100 Connection:  
Keep-Alive <cr><lf>Content Type: text/html; charset=ISO-8859-1<cr><lf><cr><lf><!doc type  
html public "-//w3c//dtd html 4.0transitional//en"><lf><html><head><meta http-equiv="Content-  
Type"content="text/html; charset=iso-8859-1"><meta name="GENERATOR"content="Mozilla/4.79 [en]  
(Windows NT 5.0; U) Netscape]"><lf> <title>CMPSCI 453 / 591 / NTU-ST550ASpring 2005 home-  
page</title><lf></head><lf> <much more document text following here (not shown)>
```

(a) Was the server able to successfully find the document or not? What time was the document reply provided?

Yes, the request was successful. Tue, 07 Mar 2008 12:39:45 GMT

(b) When was the document last modified?

Sat, 10 Dec 2005 18:27:46 GMT

(c) How many bytes are there in the document being returned?

3874 bytes

- (d) What are the first 5 bytes of the document being returned? Did the server agree to a persistent connection?

The first five bytes returned were <!doc. Yes, the server agreed to the persistent connection.

3. Problem P22, Chapter 2 (30%)

Consider distributing a file of $F=15$ Gbits to N peers. The server has an upload rate of $u_s = 30Mbps$, and each peer has a download rate of $d_i = 2Mbps$ and an upload rate of u . For $N = 10, 100$, and 1000 and $u = 300Kbps, 700Kbps$, and $2Mbps$, prepare a chart giving the minimum distribution time for each of the combinations of N and u for both client-server distribution and P2P distribution.

$$\text{end-to-end}_{C-S} = \max \left\{ \frac{NF}{u_s}, \frac{F}{d_{min}} \right\}$$

$$\max_{N=10} \left\{ \frac{(10)(15 \times 10^9)}{30 \times 10^6} = 5000s, \frac{15 \times 10^9}{2 \times 10^6} = 7500s \right\} = 7500s$$

$$\max_{N=100} \left\{ \frac{(100)(15 \times 10^9)}{30 \times 10^6} = 50000s, \frac{15 \times 10^9}{2 \times 10^6} = 7500s \right\} = 50000s$$

$$\max_{N=1000} \left\{ \frac{(1000)(15 \times 10^9)}{30 \times 10^6} = 500000s, \frac{15 \times 10^9}{2 \times 10^6} = 7500s \right\} = 500000s$$

$$\text{end-to-end}_{P2P} = \max \left\{ \frac{F}{u_s}, \frac{F}{d_{min}}, \frac{NF}{u_s + \sum_{i=1}^N u_i} \right\}$$

$$\max_{N=10, u_i=300} \left\{ \frac{(15 \times 10^9)}{30 \times 10^6} = 500s, \frac{15 \times 10^9}{2 \times 10^6} = 7500s, \frac{(10)(15 \times 10^9)}{30 \times 10^6 + 10 \times 300 \times 10^3} = 4545.5s \right\} = 7500s$$

$$\max_{N=100, u_i=300} \left\{ \frac{(15 \times 10^9)}{30 \times 10^6} = 500s, \frac{15 \times 10^9}{2 \times 10^6} = 7500s, \frac{(100)(15 \times 10^9)}{30 \times 10^6 + 100 \times 300 \times 10^3} = 25000s \right\} = 25000s$$

$$\max_{N=1000, u_i=300} \left\{ \frac{(15 \times 10^9)}{30 \times 10^6} = 500s, \frac{15 \times 10^9}{2 \times 10^6} = 7500s, \frac{(1000)(15 \times 10^9)}{30 \times 10^6 + 1000 \times 300 \times 10^3} = 45455s \right\} = 45455s$$

$$\max_{N=10, u_i=700} \left\{ \frac{(15 \times 10^9)}{30 \times 10^6} = 500s, \frac{15 \times 10^9}{2 \times 10^6} = 7500s, \frac{(10)(15 \times 10^9)}{30 \times 10^6 + 10 \times 700 \times 10^3} = 4054s \right\} = 7500s$$

$$\max_{N=100, u_i=700} \left\{ \frac{(15 \times 10^9)}{30 \times 10^6} = 500s, \frac{15 \times 10^9}{2 \times 10^6} = 7500s, \frac{(100)(15 \times 10^9)}{30 \times 10^6 + 100 \times 700 \times 10^3} = 15000s \right\} = 15000s$$

$$\max_{N=1000, u_i=700} \left\{ \frac{(15 \times 10^9)}{30 \times 10^6} = 500s, \frac{15 \times 10^9}{2 \times 10^6} = 7500s, \frac{(1000)(15 \times 10^9)}{30 \times 10^6 + 1000 \times 700 \times 10^3} = 20548s \right\} = 20548s$$

$$\max_{N=10, u_i=2000} \left\{ \frac{(15 \times 10^9)}{30 \times 10^6} = 500s, \frac{15 \times 10^9}{2 \times 10^6} = 7500s, \frac{(10)(15 \times 10^9)}{30 \times 10^6 + 10 \times 2000 \times 10^3} = 4054s \right\} = 7500s$$

$$\max_{N=100, u_i=2000} \left\{ \frac{(15 \times 10^9)}{30 \times 10^6} = 500s, \frac{15 \times 10^9}{2 \times 10^6} = 7500s, \frac{(100)(15 \times 10^9)}{30 \times 10^6 + 100 \times 2000 \times 10^3} = 6521s \right\} = 7500s$$

$$\max_{N=1000, u_i=2000} \left\{ \frac{(15 \times 10^9)}{30 \times 10^6} = 500s, \frac{15 \times 10^9}{2 \times 10^6} = 7500s, \frac{(1000)(15 \times 10^9)}{30 \times 10^6 + 1000 \times 2000 \times 10^3} = 7389s \right\} = 7500s$$

1. The Basic HTTP GET/response interaction

1. Is your browser running HTTP version 1.0 or 1.1? What version of HTTP is the server running?
HTTP/1.1

2. What languages (if any) does your browser indicate that it can accept to the server?
en-us

3. What is the IP address of your computer? Of the gaia.cs.umass.edu server?
192.168.0.6 and 128.119.245.12

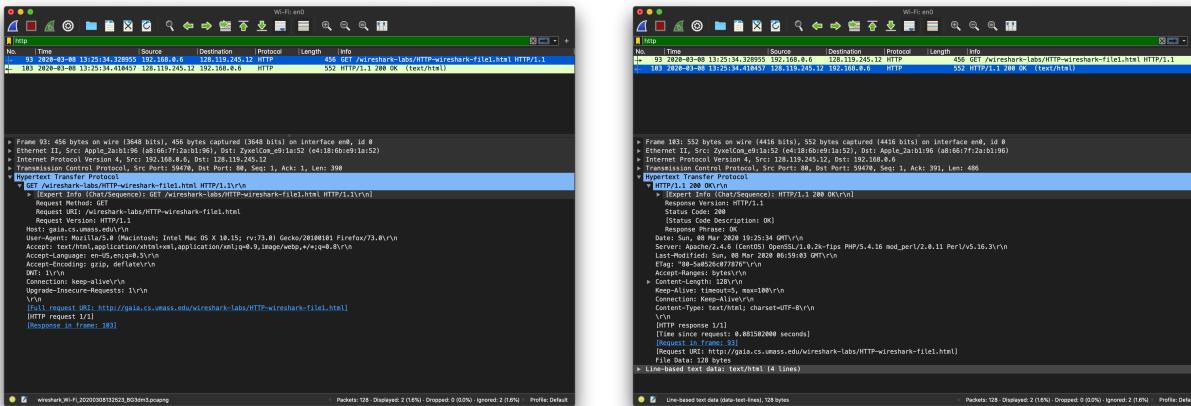
4. What is the status code returned from the server to your browser?
200 OK

5. When was the HTML file that you are retrieving last modified at the server?
Sun, 08 Mar 2020 06:59:03 GMT

6. How many bytes of content are being returned to your browser?
128

7. By inspecting the raw data in the packet content window, do you see any headers within the data that are not displayed in the packet-listing window? If so, name one.

I don't see any headers displayed in the packet content window that aren't also displayed in the packet-listing window.



2. The HTTP CONDITIONAL GET/response interaction

8. Inspect the contents of the first HTTP GET request from your browser to the server. Do you see an "IF-MODIFIED-SINCE" line in the HTTP GET?

No, there is not an IF-MODIFIED-SINCE line.

9. Inspect the contents of the server response. Did the server explicitly return the contents of the file? How can you tell?

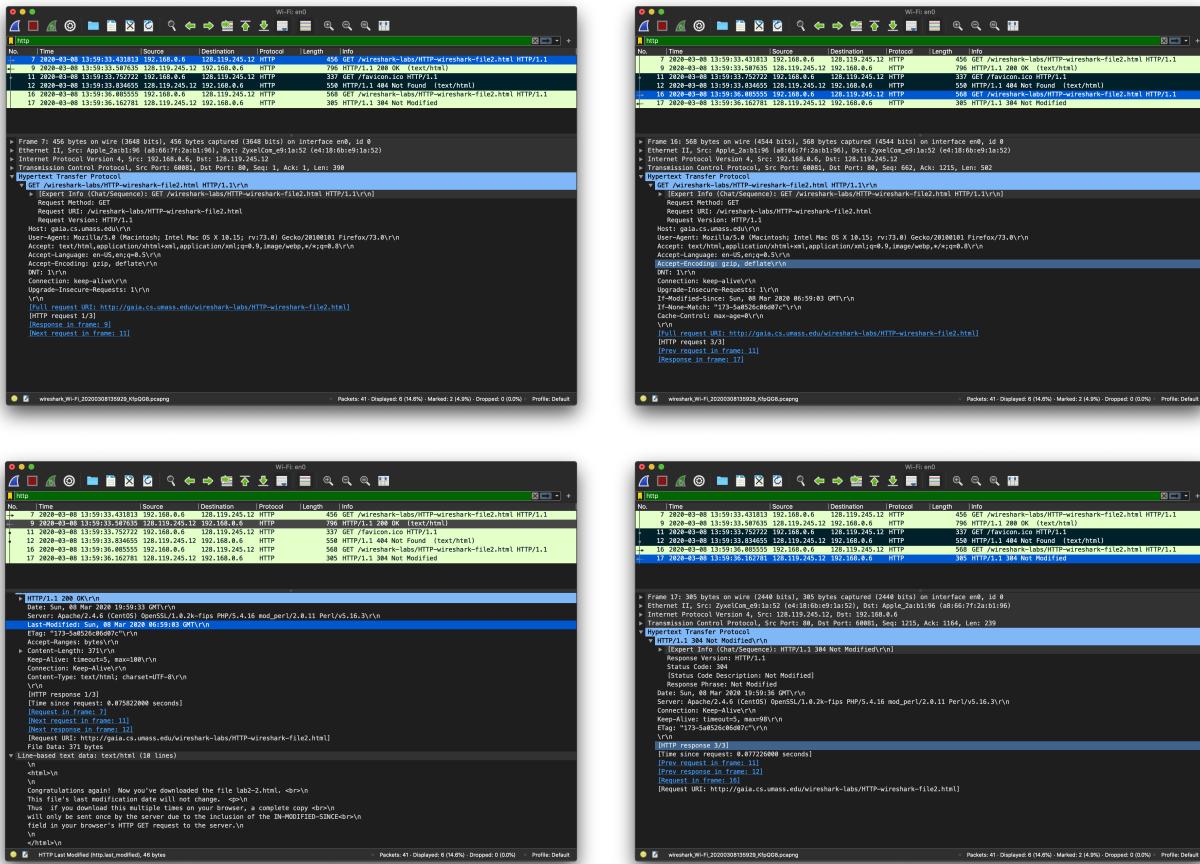
Yes, the server explicitly returned the contents of the file. The contents are shown below.

10. Now inspect the contents of the second HTTP GET request from your browser to the server. Do you see an "IF-MODIFIED-SINCE:" line in the HTTP GET? If so, what information follows the "IF-MODIFIED-SINCE:" header?

Yes, there is an IF-MODIFIED-SINCE line in the HTTP GET. The header value is: Sun, 08 Mar 2020 06:59:03 GMT.

11. What is the HTTP status code and phrase returned from the server in response to this second HTTP GET? Did the server explicitly return the contents of the file? Explain.

The HTTP status code and phrase returned from the server is: 304 Not Modified and the server did not return the contents of the file because the contents have not been modified since the last request and are still cached locally.



3. Retrieving Long Documents

12. How many HTTP GET request messages did your browser send? Which packet number in the trace contains the GET message for the Bill or Rights?

The browser only sent one HTTP GET request. Packet number 22 contains the GET message.

13. Which packet number in the trace contains the status code and phrase associated with the response to the HTTP GET request?

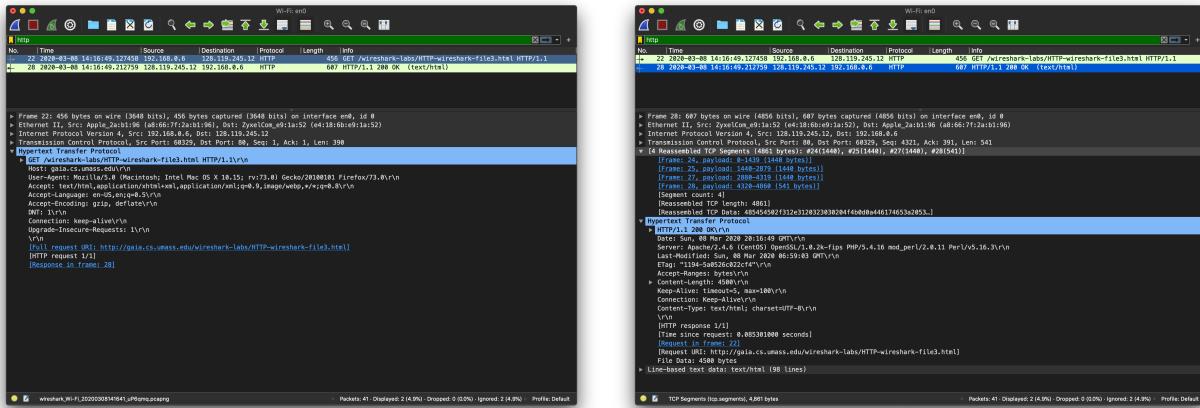
Packet 28 contains the status code and phrase associated with the response.

14. What is the status code and phrase in the response?

200 OK

15. How many data-containing TCP segments were needed to carry the single HTTP response and the text of the Bill of Rights?

Four TCP segments were needed to carry the response and text.



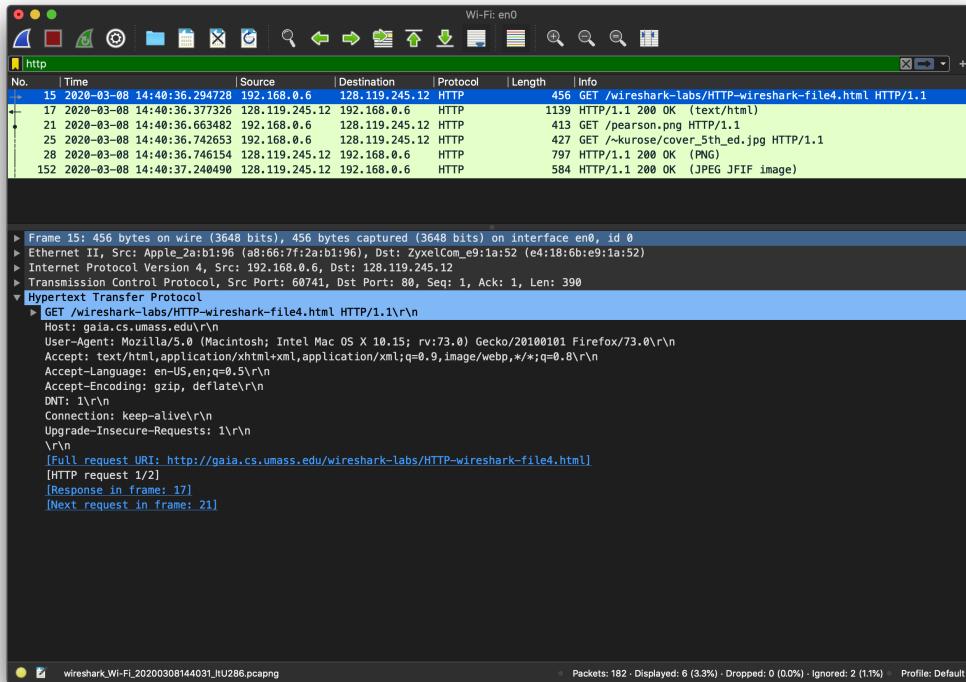
4. HTML Documents with Embedded Objects

16. How many HTTP GET request messages did your browser send? To which Internet addresses were these GET requests sent?

There are three HTTP GET requests. In my trace, all three were sent to the same IP address: 128.119.245.12.

17. Can you tell whether your browser downloaded the two images serially, or whether they were downloaded from the two web sites in parallel? Explain.

It appears that both images were downloaded in parallel as both requests were placed, then both images were received, as opposed to requesting one, receiving one, then requesting the second, receiving the second.



5. HTTP Authentication

18. What is the server's response (status code and phrase) in response to the initial HTTP GET message from your browser?

401 Unauthorized

19. When your browser sends the HTTP GET message for the second time, what new field is included in the HTTP GET message?

Authorization: Basic d2lyZXNoYXJrLXN0dWR1bnRz0m51dHdvcms=

Credentials: wireshark-students:network

